Plasmid-mediated carbapenem and colistin resistance in a clinical isolate of *Escherichia coli*

Acquired resistance to polymyxins is increasingly reported in Enterobacteriaceae, and particularly in *Klebsiella pneumoniae*. This increased resistance is extremely worrying considering that polymyxins are last-resort antibiotics for treating infections due to carbapenem-resistant Enterobacteriaceae.

Findings from a study by Yi-Yun Liu and colleagues[1] identified the plasmid-mediated *mcr-1* gene encoding a phosphoethanolamine transferase conferring resistance to polymyxins. This transmissible gene was identified from *Escherichia coli* and *K pneumoniae* isolates from animal sources (farm pigs, and retail meat from pork and chicken), but also from human sources, from several Chinese regions.[1]

We report here an *E coli* strain harbouring both plasmid-borne carbapenem and colistin resistance genes. That strain was recovered from urine cultures of an 83-year-old man who was admitted to hospital for diverticulitis in December, 2015, in Switzerland. He had renal deficiency and was therefore submitted to regular dialysis. *E coli* isolate KRI was resistant to most β-lactams (remaining susceptible to aztreonam) and resistant or of intermediate susceptibility to carbapenems (minimum inhibitory concentrations were 4 μg/mL for imipenem, 4 μg/mL for ertapenem, and 2 μg/mL for meropenem).[2] This isolate was also resistant to chloramphenicol, gentamicin, kanamycin, tobramycin, sulfonamides, tetracycline, co-trimoxazole, and fluoroquinolones, remaining susceptible only to amikacin, tigecycline, and fosfomycin. Noteworthy, it was resistant to colistin, with a minimum inhibitory concentration of 4 μg/mL.

PCR and sequencing revealed that *E coli* KRI harboured the bla_{VIM-1} carbapenemase[4] gene and the *mcr-1* gene. Additionally, the *floR* gene encoding resistance to florfenicol was identified. Mating-out assays done as previously described[3] identified the *mcr-1* gene on a roughly 60 kb plasmid, encoding resistance to colistin, chloramphenicol, florfenicol, and co-trimoxazole. Multilocus sequence typing identified *E coli* KRI as belonging to clonal complex (CC) 23.[4]

The origin of this *E coli* strain remains unknown since the patient did not travel abroad. An animal origin of the strains is indicated on the basis of the large usage of colistin in veterinary medicine that may have selected for colistin resistance, the florfenicol resistance trait widely observed with animal isolates related to florfenicol usage in veterinary medicine, and the recurrent identification of VIM-1-producing *E coli* strains in veterinary medicine. An animal origin of this strain reinforces the idea that antibiotic resistance issues should be considered as a one-health one-world approach. Finally, such accumulation of multidrug resistance traits may correspond to an ultimate step toward pandrug resistance in Enterobacteriaceae, considering that no new drugs against polymyxin resistant and metallo-β-lactamase producers will be marketed in the near future.

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